

Digital Technology and Intellectual Property

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Abstract— The law of intellectual property is being profoundly affected by the widespread adoption of digital technology. This paper reviews the rarely considered history and philosophy of digital technology and of intellectual property law to reveal the misconception of certain popular beliefs. This leads in to some observations about the implications of the world-wide adoption of digital technology and the efforts to impose and extend intellectual property rights globally.

Keywords— digital technology, computers, networks, the World Wide Web, intellectual property, history, jurisprudence.

I. INTRODUCTION

LAW IS becoming more extensive, more encroaching, more resorted to privately and commercially, more often applied to everyday life, more unstable, more controversial, and vastly more difficult for anyone to understand.

This great magnification of law has been made possible by the use of digital technology. The power of the computer now underpins the activity of legislators, bureaucrats, lawyers, police, and judges, in recording and administering multitudinous rules and regulations, as it does the activity of large businesses, and even of professional malefactors, in exploiting the law.

The power of the computer, and of other digital machinery, has itself provoked changes in law designed to constrain and control the use of computers and the particular products of that use.

Intellectual property law is ramifying in highly controversial ways. Now that governments seem chiefly focussed on the economy, the development of such law seems mainly to be dictated by the interests of the economy. Not everyone is as keen on untrammelled economic development as Western governments, however. Recently there has been terrorism directed against world trade and violent demonstrations against globalisation.

Many professions are concerned in developments at the junction of technology and law. These are very important developments and so should be examined more closely by those outside the practice of law, as I am, who have an opportunity if not a duty to influence these developments.

In the following the evolution and nature of digital technology is first outlined. Then the origin and basis of law, in particular of the law relating to intellectual property, is examined. The present status of this technology and of this law is then reviewed. Lastly, some of the prospects for digital technology, and for its influence on intellectual property law, are suggested.

The views in this article are expressed against a background of English and related law, but there is enough similarity in principle with European and other law for the

ideas to remain valid.

To treat such a broad topic in such a brief space is to expose the selected and abbreviated facts and reasoning to criticism of their detail. However, this article is intended to motivate the reader to consider more carefully what is happening, and what is likely to happen, as digital technology is more widely and intensely adopted, in its effects on our global society and its laws.

II. DIGITAL TECHNOLOGY

There is no doubt that the adoption and development of digital technology is highly significant in today's world. It is therefore of great importance that its true nature and significance be understood.

However, digital technology is very often misunderstood. For instance there is a popular belief that it is new and revolutionary. In fact digital technology is neither, as the following explains in the course of outlining what it really is.

A. Data and Information

The *first* step in understanding the real nature of digital technology is understanding the true nature of "data," as defined in the International Standard Vocabulary for Information Interchange [1].

Data. A representation of facts or ideas in a formalized manner capable of being communicated or manipulated by some process.

Data must be completely distinguished from *information* if the standard is respected.

Information. In automatic data processing the meaning that a human assigns to data by means of the known conventions used in its representation.

Thus only *people* can process information. Machines can *only* process data.

It is a great tragedy that the computing profession, and thence the public at large, fails to use these definitions to make plain the distinction, arguably the most important distinction to be made—between people and machines [2].

The *second* step in understanding the real nature of digital technology is appreciating the importance of conventions in the above standard definitions, because digital technology could not exist without conventions.

Recording data digitally means using conventions that completely restrict what the record can hold. *Digital records are digital because they must be composed from a finite number of different symbols*¹. This is fundamentally important for two reasons.

¹Technically speaking, *digital* is contrasted to *analogue*. In the music industry, LPs were analogue recordings, CDs are digital recordings. Printed music is also digital, being conventionally composed from a limited set of symbols. By the same reasoning, natural language in its various forms is also digital.

1. Because of the conventional restriction, whenever digital data are read from a record or received from a signal, the convention allows the original record or signal to be perfectly reconstructed despite some variation or deterioration. Contrast this with analogue telephony in which noise is picked up during the analogue transmission of the signal and the noise is amplified and added to at every stage of transmission—this used sometimes to make long distance telephony very difficult.

2. When recording facts or ideas digitally, the information or meaning is restricted by the number of symbols to be used and the space available for the data.

The conversion of facts, ideas, feelings, perceptions—the totality of human experience—into digital form is a basic human activity involving classification in the choosing of symbols. Every normal speech act is a digital encoding in which the symbols are restricted by the speaker's vocabulary, and the sequence of symbols is restricted by the speaker's grammar.

Thus human civilisation, whether oral or literate, is fundamentally digital in this technical sense. There is nothing recent about digital technology. Human civilisation was made possible by the adoption and extension of conventions for digitising facts and ideas. Human cultures are wonderfully rich because their many conventions are richly varied, and so their accumulations of facts and ideas are also richly varied.

B. Data Engineering

Different branches of engineering are responsible for dealing with different kinds of natural resources—electrical engineering, for example, deals with electricity, and data engineering deals with data.

Traditionally, the study of engineering has segregated its subject matter into three divisions:

Statics. What the natural resource is: its properties and characteristics,

Dynamics. How the natural resource behaves: its interactions and processes,

Mechanics. How the natural resource can be used: procedures and machinery for acquiring and manipulating it.

In the case of data engineering, the natural resource is data, perhaps the most abundant of all resources. The study of data engineering can be divided just like other branches of engineering [3].

Digital engineering is the human occupation of designing and implementing systems based on the use of digital data. Because data can be analogue as well as digital, data engineering is wider than but includes digital engineering. However, data engineering is the usual phrase because nowadays almost all data are digital.

The earliest digital systems were the social systems based on laws and customs expressed in language oral and then literate. Data engineering therefore came before military and later branches of engineering, and there is no newness in it. Computers, the Internet, and the World Wide Web merely continue the millennia-long development of digital systems [4].

B.1 Data Statics and the Web

Data statics is the study of conventions and methods for representation of facts and ideas.

Ideas and facts may be digitally encoded according to a variety of conventions. The conventions determine which symbols are chosen to represent digitally the facts or ideas being encoded.

Natural language is usually regarded as being symbolic at a variety of levels, each level having its own set of conventions. The most familiar level is that of the word, a somewhat arbitrary level, and the conventions at that level relate to vocabulary.

Words in natural language may be represented in a variety of ways, as a sequence of phonic symbols in speech, of kinetic symbols in sign language, and of graphic symbols in written language. The symbols may be represented as ink on paper, as photonic dots and dashes in radio Morse code, as holes in paper tape, as magnetic fields in the surface of diskettes, and so on. Obviously there are correspondences between the different recording and transmitting media.

One of the wonders of the modern world is the World Wide Web. The Web is simply a lot of files and their directories stored in computers all around the world. But there has always been a World Wide Web as long as there have been world wide libraries [5].

Words may be gathered in collections: utterances in speech, sentences in written language. Utterances may be collected in sagas in an oral society. Sentences may be collected in paragraphs, paragraphs in chapters, chapters in books, and books in libraries.

Nowadays, magnetically recorded characters may be collected in fields, fields may be collected in records, records may be collected in files, and files may be collected within directories, and directories may be collected within operating systems.

B.2 Data Dynamics and the Net

Data dynamics is the study of processes and algorithms for the transmission and transformation of data.

Every day of our lives we process data in some way or other. Nowadays much of our data processing is assisted by digital machinery, but such machinery simply carries out processes very much like the processes that have defined our cultures and civilisations throughout their history. There's nothing basically new in data dynamics.

For instance, two centuries ago in many countries, a written message could, by reference to a code book, be translated to semaphore symbols which a chain of signallers would transmit to a receiver who could use another code book to translate the semaphore symbol back to a representation of the original written message.

Data may be moved from place to place, transformed from one system of representation to another or one medium to another, or modified by extraction, combination, transformation, and a variety of other processes.

Of course data dynamics and data statics are closely interdependent. Intercommunal and intercultural data exchange is also as old as human civilisation, and even the

Internet, a process of data dynamics, is an old idea [6]. The modern Internet is the dynamic agent that links all the files and directories of the World Wide Web, an artifact of data statics.

B.3 Data Mechanics and the Computer

Data mechanics is the study of the devices and machinery that implement the processes of data dynamics and apply them to the representations of data statics.

There are machines for transmitting and receiving digital data, machines such as drums, mirrors, semaphores, radios, telephones, modems, and routers and all the other paraphernalia of the Internet.

There are machines for capturing and holding data digitally, machines such as styluses, abacuses, printing presses, typewriters, telephone dials, magnetic disk drives, satellites, PDAS, and, most recently, digital cameras.

There are machines for transforming digital data, including the machines that present and display digital data to us, as well as all the calculating devices there ever were, leading up to the modern digital computer.

These devices and machines only do the kind of thing humans originally did in spoken language with their hearing, their brains, and their vocal tracts, and in sign language with their sight, their brains and their motor system. Digital technology only allows us to do much better what we have been doing all along.

C. *Cui Bono?*

Digital technology, then, has a history as long as civilisation, and is justified as having made civilisation possible. From the human point of view, digital technology is presumed to be a good thing because civilisation is a good thing.

The UNDP annual reports have for some time been documenting the accelerating gap between rich and poor countries, and between the rich and poor within countries [7]. The beginning of this acceleration seems to have started at about the same time as the adoption of electronic digital technology began accelerating, and the possibility of the technology being the cause of the widening gap should at least be considered.

The stock answer to the question of who benefits from digital technology is that everyone benefits. After all, civilisation benefits everyone, doesn't it? It must be very clear, however, that these benefits have always been spread rather unevenly. And indeed the unevenness has become much more pronounced.

Modern digital technology is expensive, and it is also effective. The greatest benefit can be gained by those who can best afford the technology, by bureaucrats and plutocrats. This phenomenon is known as the *dumbbell effect*.²

The usual counter argument to this is that digital technology, specifically personal computers, are cheap. But

²If two inflated balloons are connected by a pipe (the set-up looks like a dumbbell) then the air moves out of the less inflated one into the other. This is a physical analogy for the message of the once popular song: "The rich get rich, and the poor get poorer."

firstly, they are not cheap to anyone living in poverty, which is the majority of the world's population. And secondly, the really cheap ones for personal use in entertainment tend to diminish the culture and civilisation of their users.

III. LAW AND INTELLECTUAL PROPERTY

The creation and administration of law is the background to everyday life in civilised society. Indeed it is difficult to imagine how an ordered society could persist stably without a legal system of some kind.

There have been, and still are, many different systems of law [8], but law might in general be defined as a set of rules adopted by or imposed on a people to regulate the behaviour and interaction of those people.

Property law, which defines ownership and its accompanying rights and duties, is a distinctive branch of law. Property may be tangible—physically real, or intangible—immaterial or symbolic. Some increasingly significant kinds of intangible property have recently been grouped under the term "intellectual property."

It is widely believed that the law relating to intellectual property is a coherent system intended to reward inventors and other creative people, and it is held to encourage innovation and learning. In fact intellectual property law is incoherent, was never originally intended to reward inventors and other creators, and is often used to suppress innovation and learning.

A. Law

Systems of law develop in various ways, but at the extremes there are two very different kinds of system.

- In an *authoritarian* legal system the rules are used by or on behalf of one class or group of people to control the behaviour of other people.
- In an *egalitarian* legal system the rules are used by or on behalf of the entire community to control the behaviour and interaction of all members of the community.

This classification finds an echo in "legal theory [which] has sought the key to the understanding of law sometimes in the simple idea of an order backed by threats and sometimes in the complex idea of morality." [9, p. 213]

Modern systems of law, at least in developed countries, fall somewhere between the two extremes. It is a matter of opinion just where within the spectrum any particular system of law might be placed, but, as a rough indication, it could be taken that people governed by an authoritarian legal system consider themselves *subjects*, while people governed by an egalitarian system consider themselves *citizens*.

In an authoritarian system, those in authority have rights, while their subjects have duties. In an egalitarian system, duties always accompany rights.

B. Property

In small independent communities, rights and duties belong to people. When communities become more complex, artificial entities—institutions and other corporations—are defined in law so that rights and duties may be more

strongly enforced (by bureaucrats and police, for example), and so that rights and duties may be restricted (by limited liability corporations, for example) [10].

In law, rights and duties may be created and exchanged between natural or artificial entities, under contract law for example. Such rights and duties regulate only the interaction of the two entities involved.

In contrast, the law provides for rights and duties to be created for an entity which regulate the interaction of that entity with *all* other entities governed by that law. Such rights and duties relate to *property*, and the entity which acquires such rights and duties is the *owner* of the property.

The economy, which is the sum of commercial activity and which has become the prime concern of elected government in developed countries, consists in the creation, acquisition, and exchange of property, mostly by artificial entities of limited rights and duties. *Property* is the *raison d'être* of commerce, and commerce is largely controlled through artificial entities.

There are two kinds of property, *tangible* and *intangible*.

Tangible property may be, at least in English law, "real property" which is land and things attached to land, or moveable property like computers and books. Tangible property can be occupied or possessed, and this is a *prima facie* basis for ownership. Occupation or possession is a principal right of ownership of tangible property.

Intangible property is property that cannot be possessed or occupied. The main class of intangible property in English law has been described as "rights of property which can only be claimed or enforced by [legal] action and not by physical possession." Examples of this class are company shareholdings, debts owed, and intellectual property [11, p. 461].

Tangible and intangible property may be closely associated. Thus, if you buy a book then the ink and paper of that book are physically your property, but the representation of ideas inherent in the arrangement of ink within the book (though not the ink itself) belongs to the owner of copyright in the book. The book is tangible, but the representation is not.

C. Intellectual Property

The phrase "intellectual property" is commonly used with no awareness that it refers to many quite different kinds of intangible property. Law for those different kinds had developed independently and with no coherent philosophy [12, p. 2].

The lack of any overall principle is an unfortunate circumstance. It leads to confusion in people's minds and anger and resentment in those who feel that they are being disadvantaged by the application of laws which even the lawyers do not understand.³

³A famous obiter dictum of Roxburgh J. runs "The whole trouble is, that the English language is unsuited to patent actions." [13, p. 1] Although extreme complexity and artificiality characterises intellectual property law, it is becoming notorious in other branches of law, particularly in taxation.

This agglomeration of different kinds of intangible property seems to be motivated by the desire to develop global commerce. The definition of intellectual property in Article 2 (viii) of the 1967 Convention Establishing the World Intellectual Property Organization (WIPO) starts by listing rights relating to seven classes of potential intangible property, and ends with an ambit claim to "all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields." [12, p. 2]

This Convention clearly promotes authoritative law, firstly because it is international and thus imposed on individual states, and secondly because its definition of intellectual property mentions only rights. There are apparently no accompanying duties, as there would be in egalitarian law.

Until recently intellectual property was equated to copyright, and distinguished from industrial property, which included patents and trade marks. The distinction was abandoned, but this doesn't mean that some other distinction would not be useful in making the ideas easier to grasp.

Indeed, there is a very clear and useful distinction to be made. Here I propose, and describe, a classification of intellectual property into "property in identification" and "property in facts or ideas," a classification based on the history and philosophy of intellectual property.

D. Property in Identification

The last three categories of intellectual property enlisted by the 1967 WIPO Convention are

"(5) industrial designs;

(6) trade marks, service marks,

and commercial names and designations;

(7) protection against unfair competition;" [12, p. 2].

More significant is the World Trade Organization's 1995 Agreement on Trade-Related Aspects of Intellectual Property Rights (usually abbreviated to TRIPS), because it binds all members of the WTO.

The TRIPS Agreement has no general definition of what intellectual property is. Instead it lists eight categories of standards, six of which are

"2 Trademarks

3 Geographical Indications

4 Industrial Designs

6 Layout-Designs (Topographies) of Integrated Circuits

7 Protection of Undisclosed Information

8 Control of Anti-Competitive Practices

in Contractual Licences" [14, p. 659].

A collation of Australian intellectual property legislation [15] includes the Plant Breeder's Rights Act of 1994, and extracts from the Trade Practices Act of 1974.

The salient thing about these sets of categories is the inclusion in them of "protection against unfair competition," "protection of undisclosed information," "control of anti-competitive practices," and "trade practices." These relate to the regulation of business rather than to intangible property *per se*.

The remaining categories directly relate to intangible property, and are certainly relevant to the conduct of busi-

ness, but only in respect of identification of businesses or their goods and services. Such identification is the basis for the conduct and regulation of business.

Trade marks, service marks, commercial names and designations, and geographical indications are *labels*, identifying a corporation or the category or origin of its goods or services.

Industrial designs, layout designs, and plant breeds are physical *configurations*, identifying a product by distinguishing it from other products.⁴

Intellectual property of these kinds is intangible property in labels and configurations used to identify and distinguish in various ways businesses (and other entities) and their goods and services.

It should be noted here that rights under intellectual property law are monopoly rights. Monopolies are usually considered to be *prima facie* evidence of unfair trading—see the history of copyright and of patents given in the next section. But it should be observed that monopolies in the identification and distinction of goods and services may be depicted as supporting fair trading by providing protection for business reputations, and by preventing goods from being passed off under deceitfully implied reputations.

E. Property in Facts and Ideas

The two categories of intellectual property not included in the above are patents and copyright, which, it is argued in the following, fall into a different class altogether.

Historically, copyright gave temporary monopoly in copying representations of facts and ideas, patents gave temporary monopoly in industrial use of ideas. There were good reasons for property of these kinds to be restricted in these ways, and the reasons still seem valid though the restrictions are now being loosened or abandoned.

E.1 Copyright

In 1557 in England Queen Mary gave monopoly in publishing by royal charter to the Stationers' Company so that the spread of seditious and heretical documents could be hindered. By the beginning of the 18th century the monopolism had become so extreme that a completely different system was brought in by the *Act of Anne* in 1709.

This Act, the inspiration of most copyright law until the widespread adoption of modern commercial digital technology, brought in three new basic ideas. Firstly that the purpose of copyright was the "Encouragement of Learning." Secondly that rights belonged in the first instance to authors. Thirdly that the duration of copyright should be limited.

The Act of Anne was very strongly contested in the courts by the Stationers, and was the subject of intense public debate in 18th century England. To the credit of

the times, its principles survived [17, pp. 22–28], until recently.

E.2 Patents

The first known patent was granted in 1421 by the city state of Florence, but the first patent system was enacted into law by the city of Venice in 1474 providing ten years of monopoly for "any new and ingenious artifice not made previously in our state" [18, p. 614]. The system was widely adopted during the 16th century in continental Europe.

In 16th century England the Crown also adopted the idea but extended the granting of monopolies very widely for enrichment by royalties from the monopolies. However, in 1602 the court trying the *Case of Monopolies* overturned a patent, declaring monopolies "generally invalid because they operated in restraint of trade and tended to increase prices and reduce quality" [12, p. 272].

The ensuing ruckus led to England's House of Commons enacting the Statute of Monopolies in 1624, and it "declared void all monopolies for the sole buying, selling, making or using anything in the realm." The only exception was for the "sole working or making of any manner of new manufacture" [12, *loc. cit.*].

F. The Intentions

In the case of *property in identification*, the direct intention of the law was, and is, to regulate the conduct of business. Indirectly, the customers at large would benefit from the better practice of business, and from the encouragement of competition, at least in theory.

The case of *property in facts and ideas* is a little more complex.

Copyright, as set up in the Act of Anne and as it developed, was intended to encourage learning. The idea was that the grant of monopoly would encourage publication and further creativity (creativity is not a requirement for property in identification), and the term of copyright was limited so that the public domain would be enriched when the monopoly ended.

Copyright was intended for the public good. Only relatively recently has the purpose become commercial: "the protection of the rights of authors in their literary and artistic works" [19, art. 1].

Patents were clearly intended for the public good. The Statute of Monopolies required owners of patents to implement their invention and to train apprentices in its use, the term of the patent being two or, at most, three apprenticeships—14 or 21 years. In later years the invention was required to be fully specified, and the specification was published, and so in the public domain as an idea, when or before the patent was granted.

Patents were intended, not as a reward, but as a *compensation* for revealing the invention rather than keeping it a trade secret.

The situation was similar in the U.S.A. "When James Madison drafted the Constitution, copyright and patent powers were seen as very narrow. Madison and Jefferson corresponded about the evils of monopolies (which both

⁴Plant breeder's rights relate to plant varieties, and rights in respect of the "initial variety" extend, *inter alia*, to "any other plant variety that is not clearly distinguishable from the initial variety" [16, s. 13(a)(i)]. The TRIPS agreement requires that WTO "Members shall provide for the protection of plant varieties" under the Article on patentable subject matter [14, A. 27 s. 3. (b)]!

agreed were very great) and the possibility that monopolies might nonetheless be justified if they were limited in time and scope and aimed at encouraging the production of new knowledge. Jefferson grudgingly agreed, and the intellectual property regime that ruled until recently was ... limited and porous.” [20]

IV. THE STATUS

Digital technology and intellectual property law are widely misunderstood, both of themselves and in their influence on each other.

The outlines above have given some idea of the background to each. Before suggesting a few lines of development, it is appropriate to repeat some of the background to relate it to the situation at present.

A. Digital Technology Now

Digital technology is the basis of human cultures. Present day digital technology has evolved from the past, and aspects of it which show continuing evolution can easily be found.

Digital technology is not revolutionary. The more significant use of the technology—in government and business—has always been to enable present methods to continue and be improved, to avoid enforced or drastic change [22]. Novelty is a marketing ploy. The recent dot-com bubble and its “New Economy was a gigantic pyramid scheme, sustainable only as long as the illusion lasted that computers did anything genuinely new.” [23]

The World Wide Web has evolved from libraries, but is now in the hands of the media industries, and is being turned into a gigantic advertisement. “On the Web, marketing language reached its nirvana: the ad-free ad. For the most part the on-line versions of media outlets feature straightforward banner ads similar to their paper or broadcast versions, but many media outlets have also used the [Web] to blur the line between editorial and advertising much more aggressively than they could in the non-virtual world.” [24, p. 45]

The Internet, which evolved from telegraph and telephone, is now being used remove the middle-man from business-to-business commerce, and, just as inexorably though more slowly, from business-to-customer commerce. The Internet is international and so brings with it globalisation of business and magnification of businesses.

The computer itself has evolved so that most computers, as “microchips,” are now used as components of consumer products such as sewing machines, CD and DVD players, and macho videogame consoles. And the globalisation made possible by digital technology makes it possible for most of these consumer products to be made in third or second world countries where costs are low [24, p. xviii].

B. Intellectual Property Now

The law of intellectual property is changing fast, and is being imposed globally by the WTO through the TRIPS agreement.

The original motivation of intellectual property law was to promote or protect the public interest by curbing monopolistic behaviour by business interests—the economy. England’s *Statute of Monopolies* of 1624 condemned commercial monopolies, only allowing a limited exception in the case of industrial inventions as being in the public interest. But the anti-monopolists of more recent years have been doomed almost entirely to disappointment.

B.1 Property in Identification

Property in identification, trade marks and so on, was originally intended to ensure that the labelling or configuration of goods guaranteed the origin of those goods, and allowed the reputation of that origin to guide the buyer’s choice in a competitive market.

The idea was that would-be competitors could register their own distinctive property in identification—distinctiveness, not creativity or even originality, was the objective—and establish their own reputation on the quality of their goods. Thus a producer could succeed by consistently bettering the quality or the price, or the value for price, of the corresponding goods of competitors.

Many of the world’s largest businesses now have their goods, or at least their major components, made by subcontractors or subsidiaries in low-cost countries. Ironically this is possible because of the capability of present-day digital technology.

The trade mark or logo or business name no longer identifies the origin of the goods—the producer, but only the purveyor or franchisee.

The identification—logo or design—is then given a reputation independently of the quality of the goods by persuasion through advertising. Advertising expenditure in the United States rose from \$50 billion in 1997 to \$200 billion in 1998 [24, p. 11], by now say \$1000 per U.S. citizen—a figure far more than the average per capita income of the poorer half of the world’s population.

This new kind of commerce, selling by identity rather than by value, is called *branding* by Naomi Klein, whose description and analysis of it make sobering reading [24].

B.2 Property in Facts and Ideas

Property in facts and ideas was never really successful in its egalitarian *pro bono publico* objectives. For example, patent monopolies were granted as compensation for innovators who agreed to disclose their invention to the public rather than keep it a trade secret, as they are still entitled to do, and the hope was that this disclosure would encourage further innovation.

Patent monopolies however, are more typically used to stifle competition and innovation. “Until 1800 the Watt engine was protected by a master patent which Boulton & Watt defended so energetically that further development was almost completely frustrated.” [25, p. 58] The WTO sponsored extension of the term of patents to twenty years seems designed to extend the anticompetitive possibilities of patent monopolies.

B.3 Intellectual Property Extension

The categories of work or innovation eligible for monopoly protection have been repeatedly extended under the guise of responding to new technologies. The changes all seem intended to make vendible property out of facts and ideas that would otherwise be in the public domain.

“Elements of creativity that were once part of an intellectual commons free to all get swept into various legal enclosures controlled by businesses fearing that change will undermine an industry structure that they find profitable.” [20]

Copyright law is being used alongside trade mark law to discourage competition. “Copyright and trademark harassment is a massive and growing industry” [24, p. 197]. Copyright law is being extended to cover anything digital that can be sold through the Web, or that can be used as a lure to accompany or enfold advertisements.

Patent law is being extended beyond something producing a vendible product [13, p. 10] to include “inventions in all fields of human endeavour [as well as] scientific discoveries” [12, p. 2] and computer programs. So-called software patents are both unnecessary⁵ and specifically denied under prior English law as a mere scheme or plan [13, p. 17]. Furthermore, programmers only use data technology the way electricians use electrical technology, and no-one has (yet) suggested that what electricians ordinarily produce should be eligible for patent protection.

Given that facts and ideas are the basis for human cultures, the push to bring commercial rights to bear on as many facts and ideas (information and patents), or their representation (data and copyright), as possible, then it seems not too wild to suggest that human culture is being commercialised [27]. Naomi Klein is forthright on this issue [24, p. 198], though coming at it from a different angle: *The underlying message is that culture is something that happens to you. You buy it at the Virgin Megastore or Toys ‘R’ Us and rent it at Blockbuster Video. It is not something in which you participate, or to which you have a right to respond.*

Such are the facts and such are the trends. Some thought should be given to where the trends are leading.

V. DATA TECHNOLOGY: THE FUTURE

Data technology is continually evolving. The path of this evolution cannot be predicted for more than say a decade because development will depend a lot on prior development and very probably on social conditions.

Nevertheless, certain broad lines of development are very likely, and some of the lines likely to be relevant to intellectual property are very briefly described below.

A. Data Statics: The Future

The capacity for storing digital data, and for storing them cheaply, is continuing to grow. This is seen both in

⁵The main point persistently ignored by software-patent proponents is that anything that can be implemented as software can equivalently be implemented as hardware [26]. The push for software patents must then be a push to extend rights.

magnetic disks for on-line data storage, and optical disks such as the newly popular DVDs for off-line storage.

The increasing on-line data storage has two prospective major uses. Firstly, businesses will be able to keep years of archival data about all business transactions so that customer behaviour can be tracked better. Secondly, media businesses can store for sale an ever greater amount of copyrightable data, ever more stimulating and addictive videos—pornography is already big business on the Web.

Methods for recording digital data more and more densely are continually being developed. The mere denseness means that such data cannot be read and converted for display without special equipment, equipment that wears out or is thrown away as obsolete. Many significant data will be lost forever because there will be no equipment left to decipher them.

The Web is being touted as replacement for the world’s libraries. But library books have a publisher’s imprimatur and a long shelf life, whereas the Web has been with justice described as anarchic and is notorious for its volatility.

B. Data Dynamics: The Future

New methods for encoding and transforming data continue to be developed, as older methods are starting to be put to use. With present technology, for example, digital television and DVD recording of video are only practical using data compression algorithms. These algorithms will be further developed so that, with improved machinery, the Net will be able to transmit satisfactory real-time video and allow good videoconferencing and multiplayer videogames.

Another promising algorithmic area being developed is the processing of digitally encoded voice signals. In its infancy, speech processing techniques have allowed marginally effective dictation systems and other voice controlled devices to be marketed. These techniques will eventually be combined with text translation techniques, such as are already being made available as services through the Web, to provide real-time speech translation, though this is some way off yet.

The processing of graphic data is also being developed, with recently developed microchips designed with instructions intended specifically for supporting the generation of moving pictures for videogames. Techniques are already available that allow real-time modification of video signals, which are intended to allow advertisements to be inserted into real scenes, for example of sporting contests.

C. Data Mechanics: The Future

Digital machinery is being strongly developed in two general areas, computation and networking.

Microprocessors are becoming ubiquitous because of the cheapness from their mass-production and the capability from their technology of design. But only about 10% of them are used overtly as computers [28].

The photocopier I use nowadays digitally encodes and stores the images it is being asked to print before it actually does any printing so that it can, for example, properly

print, fold, and staple booklets. It can also act as a networked printer and scanner.

Digital networking is being developed photonically rather than electronically. This is rather ironic, because networking is the basis for what is called electronic business (e-Business) but there is coming to be less and less electronics and more and more photonics in networking.

Optical multiplexing is able to very greatly increase the capacity of already installed optical fibres, and optical switching will soon be reducing the delays at network nodes. Optical routing will eventually make the media companies' dream of video on demand practical [29].

VI. INTELLECTUAL PROPERTY: THE FUTURE

Intellectual property is property in *data* and *information*, as defined in the computing profession's standard vocabulary [1].

Property in identification is property in labels and configurations which represent the identity of a business or the goods it sells. Labels and configurations *represent* the fact of an identity under the convention of registration and are therefore data, whether digital or not.

Property in facts or ideas is property in only the representation of facts or ideas in the case of copyright, and is (or, rather, was intended to be) property in industrial ideas in the case of patents for inventions. The property rights relate to the use of *data* in the case of copyright, and to the use of *information* in the case of patents.

A. Property in Identification: The Future

There are emerging two aspects of property in identification—the traditional trade marks, business names, registered designs, and so on, and the property identification systems coming into use to enable media businesses to enforce payment for copies of their products.

There is also a contradiction developing wherein businesses wish to protect their property in identification and at the same time wish to have the right to traffic in and use the identification of private individuals.

A.1 The Web

The data of the Web are stored at its nodes—the computers on which the data are stored. To enable the Web to be used over the Net, these nodes need to be identified, and one form of this identification is the “domain name.” Domain names are distinct from user names, and are administered internationally.

A domain name is neither a user name nor a trade mark. Great confusion has arisen because domain names have exploited trade marks. Other confusion has arisen because services and privileges can belong to nodes, or they can belong to individual users.

At the same time as the Web is being commercialised, the need for a clear system of identification is leading to stricter controls over data usage, and to development of systems for personal identification to enable personal data to be more easily and reliably exploited by government and business.

Systems are also being developed for storing product identification of and within data stored on the Web so that use of those data can be controlled and payment for that use enforced.

A.2 The Net

Identification of users on the one hand, and of products on the other hand, is the key to Net-based commerce. The communication protocols must allow users to be identified reliably so that payment can be levied, and the products must be identified so that users can reliably order them.

This is not just a matter of identification during a transaction. The weakness of the Web, from the economy's point of view, is that it is the user who chooses what is to be viewed. The economy would prefer to be able to directly market to the on-line consumer, and techniques for doing this are being developed.

Direct consumer marketing requires that consumers be reliably identified so that data on their consuming habits and weaknesses can be collected, and so that marketing pitches can be delivered in the most effective fashion.

So there are issues here of commercial property in identification, but there are also issues in the ownership of personal data [30].

A.3 The Computer

When identifications are digitally stored they can also be digitally computed. Computation with identifiers is the basis for much fraud and deceit and sabotage being carried out on the Web. Credit card fraud already costs billions of dollars every year, and it's increasing rapidly because of on-line shopping. “The use of credit cards to buy goods on the Internet has prompted record levels of fraud” in the U.K. [31].

Web crawlers, one of the more significant recent uses of computers, are programs that automatically and continuously scan on-line documents to compile indexes of their content. At the end of 2001, the company Google claimed to have indexed more than two billion documents.

Big international companies have been more and more diligent in using trade mark law to suppress competition and criticism [24, pp.196–203]. Web crawlers may be expected to be used in extension of this diligence to on-line data.

B. Property in Facts and Ideas: The Future

Patents give monopolies in ideas, copyright in expressions of facts and ideas. This is being briskly extended, copyright to ideas [34], patents to facts.

In patents and copyright there is assumed to be an inventor or creator. This is rapidly becoming invalid with the development of soft computing.⁶ The techniques of soft computing, which is in its infancy, can produce computational results from which people can get new ideas and new experiences, rather than the new facts that traditional

⁶*Soft computing* is a term that seems fortunately to be starting to replace the demeaning and misleading *artificial intelligence* and its ugly acronym, *AI* [33].

hard computing can only produce. In brief, soft programs will sooner or later be used to produce new books and new inventions.

This development will force rethinking of both patents and copyright.

The most likely result in the present political climate will be simply to extend the property definition. But the subsequent development frenzy and litigation should be entertaining.

B.1 The Web

When you have bought data represented in a directly usable form, then you expect to be able to use, to lend, to sell that form freely. At present, if you buy a CD you can play it whenever you want to, and lend it to friends so that they can play it also. This is not much longer to be the case. "In truth, as digital music payment systems emerge, you will only be buying the right to play it on devices that recognize that right and have the software to play it." [32, p. 41]

And so with other stored data—electronic books, movies, videos, anything digital that copyright can be enforced on. And if copyright can't be enforced then the property won't be marketed.

In the long run much of this content will be generated by soft computing techniques—authors, actors, performers, producers, will no longer be necessary and so reward for these creators will no longer be used to justify copyright. Of course, more and more realistic simulated celebrities will be needed, and will be able to be manufactured to need with a minimum of human intervention. Laura Croft is the very thin edge of a huge commercial wedge.

Copyright problems also arise with data extraction. Copyright has traditionally allowed extraction under certain circumstances, and independent re-expression of ideas. But with huge amounts of digital data stored where network programs can read them, the potential for programmed extraction, combining, and transformation will lead to a gargantuan gray area where there will be doubts about what the relevant copyrights are.

B.2 The Net

The Net not only connects the stored data of the Web, but it also supports other applications, such as electronic mail. Already it carries some telephony digitally, and Internet connected mobile phones are fast being adopted.

When the time arrives that many consumers carry mobile phones continuously connected to the Net, mobile phones which are continually making their location available to the Net, then very complete dynamic dossiers of consumers will be able to be maintained. There are obvious marketing advantages to this, but questions arise over the copyright in data collected from the Net.

On the patent side, there is already much controversy over the granting of patents for business processes—patents originally having been limited to industrial processes, specifically to processes producing a vendible product. With more and more business being conducted over

the Net, and using the Web or whatever business system replaces it, there will be more and more business processes being developed.

Patenting business processes is as questionable as patenting software, but will nevertheless be extended. Patents granting monopolies for new methods of manufacture were justified by the public benefit of disclosure. There is no public benefit from disclosure of business processes.

B.3 The Computer

The digital computer makes it easy to copy and transform digital data. Businesses wish to prevent such copying except when a payment has been made for the right to copy. The digital computer will increasingly be used by such businesses to prevent unpaid for copying in various ways.

The difficulty here is that the digital computer can also be used to counter the preventive methods used for digital copyright protection. This has led to businesses pressing government to make criminal the development of avoidance techniques, and the publication of these techniques.

Thus one set of interests in copyright seeks to deny to a creator the right to generate new ideas. The continual extension of intellectual property rights will continue to raise contradictions of this kind.

VII. CONCLUSION

This article has sought to explain digital technology, and to examine the relationship between that technology and the idea of, and law relating to, intellectual property.

The issues are very important, and will be increasingly discussed in legal, government, and business circles because of increasing use of data technology.

A. Digital Technology

Digital technology is, in a general sense, the basis of civilisation, of commerce, and of government. Recent developments in digital technology continue to support the evolution of civilisation, commerce, and government.

Because these developments are recent and complex, and thus unfamiliar, they seem revolutionary. They are not. Recent developments in digital technology have simply allowed the conservation and consolidation of the commercial components of our society.

Digital technology has always pervaded the institutions which control the functioning of our society.

Recent developments have also affected those institutions and brought many changes to the laws governing them and administered by them. The main effect has been to proliferate legislation and regulations and intensify their application. This is moving the laws of developed countries towards the authoritarian end of the spectrum, a movement that the tragedy of September the 11th seems to have accelerated. This authoritarian trend is particularly marked in the law of intellectual property.

B. Intellectual Property

The law of intellectual property is being greatly and rapidly extended both in its rights and in its application internationally. This extension is primarily directed to the extension of monopolism in the interests of the economy.

Rights over property in identification were originally intended to promote fair competition by allowing customers to select their purchases by comparing price with reputed value. Those rights are now being used to build brand monopolies which are based on reputations established by psychological manipulation of consumers. And there is a thundering silence in respect of duties towards the public interest.

What should be happening here is very difficult to say. It seems to me that the intensely monopolistic use of property in *labels* should strongly discouraged. On the other hand I would say that the use of property in *configurations* should be seen as the best way to ensure fair competition, and the use of digital technology would be an essential element in practical enforcement of rights in such property.

The issue of property in identification is of global significance. Naomi Klein sees opposition to globalisation changing: "a different agenda has taken hold, one that embraces globalization but seeks to wrest it from the grasp of the multinationals." [24, p.496] Her book paints a gloomy picture of branding, but there is hope at the end.

Rights over facts and ideas were originally intended to encourage learning and to bring ideas into the public domain. Those monopoly rights are now being used to make marketable commodities out of facts and ideas that heretofore were in the public domain.

John Perry Barlow has argued cogently that copyright should be abandoned [35]. Personally, I would go further and argue that the patent system should also be abandoned. New problems would doubtless arise, but on balance I feel that the benefits to people and to our culture would easily compensate for the pain of adaptation.

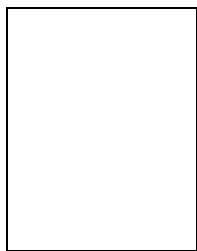
As I see it, the situation is now becoming much like that in Elizabethan England—monopolies are being used to build up a global commercial empire. Sooner or later the world will need a United Nations decision like the 1602 English one, declaring monopolies generally invalid because they operate in restraint of trade and tend to increase prices and reduce quality.

NOTE

A link list of relevant on-line material, including the URLs cited in this paper, will be found at
<http://www.comp.utas.edu.au/users/nholmes/dtip>

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